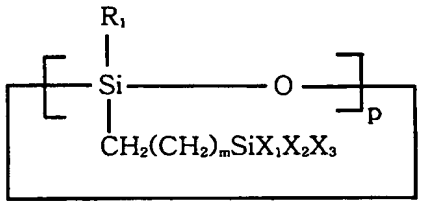
WHAT IS CLAIMED IS:

1. A siloxane-based resin prepared by hydrolyzing and polycondensing a first monomer of the formula (1) and a second monomer of the formula (2) in an organic solvent in the presence of an acid or alkaline catalyst and water:



(1)

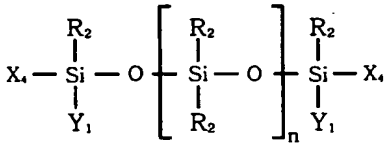
wherein,

R_1 is H, C_{1-3} alkyl or C_{6-15} aryl;

each of X_1, X_2 and X_3, independently, is C_{1-3} alkyl, C_{1-10} alkoxy or halo, provided that at least one of them is hydrolysable;

m is an integer from 0 to 10; and

p is an integer from 3 to 8; and



(2)

wherein,

R_2 is H, C_{1-3} alkyl or C_{6-15} aryl;

X_4 is C_{1-10} alkoxy;

Y_1 is C_{1-3} alkyl or C_{1-10} alkoxy; and

n is an integer from 0 to 10.

2. The siloxane-based resin according to claim 1, wherein molar ratio of the first monomer of the formula (1) to the second monomer of the formula (2) is 1:99 - 99:1.

3. The siloxane-based resin according to claim 1, wherein the catalyst is selected from the group consisting of hydrochloric acid, nitric acid, benzene sulfonic acid, oxalic acid, formic acid, potassium hydroxide, sodium hydroxide, triethylamine, sodium bicarbonate and pyridine.

4. The siloxane-based resin according to claim 1, wherein molar ratio of the monomer to the catalyst is 1:0.000001 - 1:10.

5. The siloxane-based resin according to claim 1, wherein molar ratio of the monomer to the water is 1:1 - 1:1000.

6. The siloxane-based resin according to claim 1, wherein the hydrolysis and polycondensation reactions are performed at 0-200°C for 0.1-100hrs.

7. The siloxane-based resin according to claim 1, wherein the organic solvent is selected from the group consisting of an aliphatic hydrocarbon solvent, an aromatic hydrocarbon solvent, a ketone-based solvent, an ether-based solvent, an acetate-based solvent, an alcohol-based solvent, an amide-based solvent, a silicon-based solvent, and mixtures thereof.

8. The siloxane-based resin according to claim 1, wherein Mw of the resin is 3,000-300,000.

9. A method of forming an insulating film between interconnect layers of a semiconductor device comprising the steps of:

providing a liquid coating composition by dissolving the siloxane-based resin according to claim 1 in an organic solvent;

coating a silicon wafer with the liquid coating composition to form a coating film thereon; and

heat-curing the coating film.

10. The method according to claim 9, wherein the siloxane-based resin is mixed with a porogen so that the weight ratio of the resin to the porogen is 99:1-30:70.

11. The method according to claim 9, wherein the porogen is selected from the group consisting of cyclodextrin, polycaprolactone, and a derivative thereof.

12. The method according to claim 9, wherein the organic solvent is selected from the group consisting of an aliphatic hydrocarbon solvent, an aromatic hydrocarbon solvent, a ketone-based solvent, an ether-based solvent, an acetate-based solvent, an alcohol-based solvent, an amide-based solvent, a silicon-based solvent, and mixtures thereof.

13. The method according to claim 9, wherein the organic solvent is 20-99.9wt% of the liquid coating composition.

14. The method according to claim 9, wherein the liquid coating composition is applied to the silicon wafer by spin-coating.

15. The method according to claim 9, wherein the heat-curing is conducted at a temperature of 150-600°C for 1-150 minutes.

16. An interlayer insulating film for a semiconductor device, wherein the insulating film is made from the siloxane-based resin according to claim 1.

17. The interlayer insulating film according to claim 16, wherein micropores are formed throughout the film by the use of a porogen.

18. The interlayer insulating film according to claim 17, wherein the porogen is selected from a group consisting of cyclodextrin, polycaprolactone, and derivatives thereof.

19. A semiconductor device containing an insulating film made from the siloxane-based resin according to claim 1.